

E-Learning Energy and Utilities



CERTIFIED FOR



AX 2012

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MECOMS™™ Key Concepts

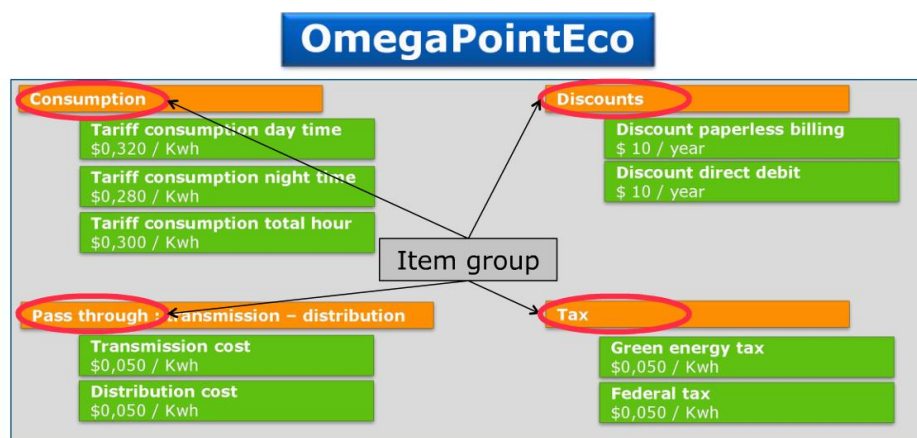
1.1 Introduction

Welcome to the third module of the Energy and Utilities E-learning ; MECOMS™ Key concepts. In this module it is not our intention to describe all concepts of the energy and utility market, as this would lead us too far. The objective would be however to introduce you to the key concepts involved in 2 years in the lifecycle of a new residential customer. This implies that we will be referring only to concepts applicable in a B2C environment. In the classroom training 'Prospect to Cash' (nowadays known as MECOMS™ Functional Overview Training) these concepts will then be applied in the MECOMS™ software package.

In this module we will be imagining that we are the electricity supplier Omegapoint and will be launching a marketing campaign for our new product OmegaPointEco. In the first section we will outline our product and the various tariffs. To continue, our marketing campaign and our product turns out to be quite the success and also Ms Sarah Doe feels this is a good offer and signs up for our services. We will then start supplying electricity to Ms Doe and will send an invoice for the energy consumed. The question here would be which input is required before we are actually able to send an invoice to this customer. High level we could say that we need to know contact and meter details, the so called master data, and obviously the consumption information. This would allow us to calculate and send an invoice. There is however a lot more than just that to consider.

1.2 Product

We will first outline what our product actually entails. This means that we will look into the different items OmegaPointEco contains and the prices or tariffs that we will charge for each item.



Our product offering concerns green electricity from renewable sources at a fixed price for 1 year. For each kWh consumed the customer will have to pay a certain amount, which is the tariff. If you look at consumption on the picture you will see that we will need to set up different tariffs for different timeframes. This allows us to offer the same product both to potential customers with a single tariff meter as to customers with a double tariff meter.

Customers who choose to go paperless and sign up for electronic billing, will get a discount of 10\$ per year. People who pay through direct debit will get an additional discount of 10\$ per year. We will also be charging pass-through costs for the transmission and distribution of electricity, and last but not least we will have to charge taxes.

To make our invoice look nice and structured, we may consider grouping certain items by putting e.g. both discounts under a header discounts. The header would then be considered the item group, whereas both discounts are the product items. In the same way the items transmission and distribution cost have been grouped in the item "Group Pass-through costs" and the item green energy and federal tax have been grouped in the item group Tax. Though consumption as such is only a single item we have created an item group nonetheless.

Consider an invoice for a double tariff meter in which we would be charging both for day time and for night time consumption. This would mean we need to add 2 invoice lines. By creating the item group consumption, these 2 invoice lines would be listed underneath a header giving the overall invoice a structured layout.

1.3 Terms and conditions

Tariffs constitute an important part of the terms and conditions we are offering our potential customers. Other things that need to be stipulated would be the start and the end date of the contract, how and when the customer can cancel his contract, and whether any charges would be linked to doing so. If you would like to get a better view on terms and conditions you can explore the website of the suppliers in your region.

1.4 Master data

We have launched our marketing campaign and Ms Sarah Doe has signed up through our web portal to start using our product as of January 1st 2013. Question now is which information we would need to be able to start invoicing Ms Doe for the consumption as of Jan 1st 2013.

High level we could say that we need to know the contact details and some technical details with regard to the connection and the meter. This is the so called master data. But exactly does this master data entail:

- Customer
- Address
- Connection
- Meter device
- Timeframes

1.5 Account type – customer

Let's begin by looking into the customer. In everyday English the customer would be the person receiving the invoice. In MECOMS™ however there is more to a customer than just that. If we would be supplying electricity to a given house e.g., we might have more than one contact to consider.

For starters we may have the owner of the house who needs to be contacted in case of meter failure as he will be the person who will be charged for technical maintenance.

Secondly we have the tenant of the house who will let us into the house to read out the meter and who would need to pay for the consumption.

Last but not least we also need to keep track of the DGO for this connection. This would be the party we need to contact in case of an outage. Both the DGO, the owner and the tenant will be regarded as customers in MECOMS™. However when we link these customers to a specific connection we will need to indicate which role they play for that connection. This role is what we call the account type. Tenant, owner and DGO are available account types, as is contractor. The contractor is the customer that would be paying the bill. In our example we will need to link Sarah Doe to the connection as the contractor.

1.6 Address

Now that we have established who the contractor is, or in other words who will be paying the bill, we would need to know the address to send the invoice to.

An address might be more complex as one might initially think. The most straightforward example would be the contractor consuming energy at a certain address and the bill that needs to be sent to the very same address.

The contractor might however also have an apartment by the seaside and would like to receive the invoice at his regular domicile. This implies that we would need to specify 2 addresses: a billing address and a delivery address. As final example we can consider a house on a street corner. The entrance of the house might be in street A, but the garage, where the meter device is located, is in street B. This example is just to show that we need to have the ability to specify multiple addresses.

1.7 Connection

Now that we have established that Sarah Doe is our contractor, and that both consumption and invoice address are on Main Street Nr 5, we need to know what is being consumed exactly. We need to identify whether this is gas, electricity or water. This can be done by creating a connection, a connection which basically connects the meter device to the main grid. In our straightforward example, this explanation would indeed apply. For each utility there would be one cable going into the house and each cable entering the house can be referred to as a connection.

For apartment buildings on the other hand, there would also be only one cable going into the building, yet each flat would have its own connection set up within MECOMS™. The reason being that each customer needs to be able to choose his own supplier. So for each utility and each contractor a connection needs to be created in MECOMS™. Every connection will have its own unique identification code. In Europe e.g. the use of the European Article Number (or EAN code) is common, not only for energy and utility markets.

1.8 Meter device



We now know that Sarah Doe is consuming electricity. What we would need to know next is which meter has been installed. This will give us important information with regards to how to collect the meter readings, how to interpret them and whether she has signed up for a double tariff or a single tariff.

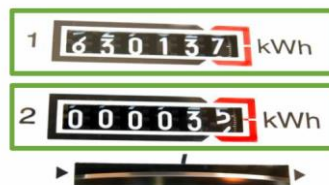
A meter device represents a physical meter. Every meter has its own technical characteristics, like a brand, a brand type, supplier, serial number and so on. MECOMS™ also has the functionality allowing you to set up custom properties such as e.g. size or place. A meter device will register every kWh, litre or cubic meter that is being consumed. Results of a meter are meter readings.

1.9 MMR – index values

How to collect these meter readings depends on the type of meter. There are meter devices which require a manual meter reading implying that somebody will need to physically go over to the meter and write down the values as seen in the row of figures also known as register. This can be done by a meter reader or by the customer himself. These types of meters are referred to as MMR meters. The values retrieved from MMR meters are known as index values.



Device + 1 register
Single tariff



Device + 2 registers
Double tariff

In case the contractor has an MMR meter with a single register, this implies he has a single tariff. Regardless of when the consumption takes place, the customer will need to pay the same price per unit. If the contractor has an MMR meter with two rows of figures he will have a double tariff. This implies that he will pay a certain tariff from e.g. 7 in the morning until 8 in the evening and a different price per unit outside this timeframe. At 7 in the morning and at 8 in the evening, a signal will be sent along the connection which will trigger the meter to start using the different register. The time when a device needs to switch from one timeframe to another is set by the DGO, this means that depending on the location, the night timeframe might start at a later or earlier time.

If a customer with a single tariff MMR meter would like to change to a double tariff this implies that he will need to have his meter replaced.

1.10 AMR – counter values

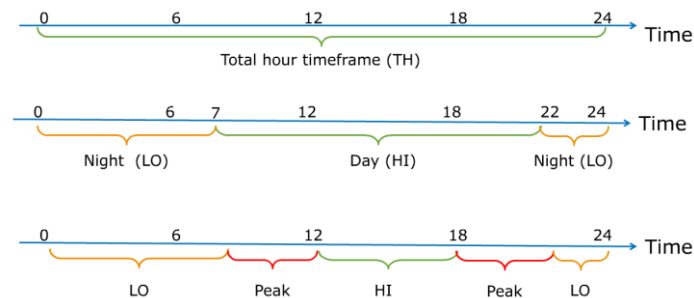
A second type of meters are AMR meters or automatic meters. These do not require human intervention to retrieve the meter readings. They register the values, also known as counter values, at regular intervals such as every 15 minutes. These values will then be sent to the meter reading company e.g. once a day or once a week. By looking at the device we can not deduct whether the contractor will have a single tariff, double tariff or a more complex tariff structure. The quarterly counter values will be compared to a calendar. This calendar will need to link every 15 minutes of every day to a given timeframe. E.g. Saturday morning 11 o'clock is linked to an off peak tariff. Once this calendar is set up, every incoming counter value can be linked to the corresponding timeframe. So in case a contractor with an AMR meter would like to switch from a single rate to a double rate he will not need to have his meter replaced.

1.11 Smart meter

Finally, there also is a smart meter. To a certain extent this can be compared to an AMR meter in the sense that metering data can be read remotely and data collection enables billing based on real time consumption.

Unlike the AMR meter however the smart meter also allows bi-directional communication. This implies for example that a smart meter can be disconnected remotely whereas an AMR meter cannot. Do not confuse smart meters with a smart grid. Though smart meters may be part of a smart grid, alone however, they do not constitute a smart grid.

1.12 Most common timeframes



We will now take a look at the most common timeframes. First of all, there is the single tariff or Total Hour timeframe. This implies the customer will pay a single tariff regardless of when he consumes.

The next timeframe is the dual tariff, which is also referred to as the day/night timeframe or high/low timeframe. This implies the customer will pay a higher rate from 7 in the morning until 10 in the evening for example, and a lower price per unit during the night. The supplier might charge e.g. 7 cents for each kWh registered on the day timeframe and 5 cents registered on the night timeframe. By making

electricity cheaper during the night people are encouraged to run their appliances during the night. E.g. run the dishwasher, do the laundry.

In our last example, we added the timeframe peak, this works in the same way as the high and low timeframe, but the peak timeframe will be linked to a higher price than the high timeframe, once again, here the suppliers want the customers to use as little electricity as possible.

1.13 Additional meter information

We do still need some additional information to know how to interpret the meter readings received. For example, a device might give a readout of 5000, but without knowing the unit of measure or without knowing the location of the decimal separator, these values are useless. We also need to know whether the meter registers consumptions or peak consumptions. If we are a supplier to end consumers it may seem quite obvious that we would like to charge them for their actual consumption. Yet MECOMS™ can also be used by a TGO who basically supplies to the DGOs and to a number of large industrial customers. In this case the TGO may decide to charge that industrial customer for his peak consumption rather than for his actual consumption. Or the invoice can consist of a combination of both the consumption and the maximum capacity used. Finally we need to consider if the meter registers consumption in a delta or cumulative approach. Let's take a second look at this.

1.14 Delta versus cumulative consumption

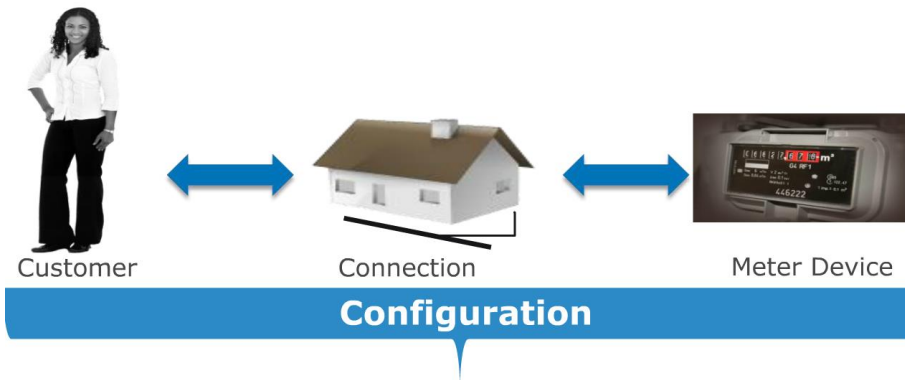
When a meter registers values in a delta approach this means that every time the meter is read the register will be reset to 0. An additional counter exists, the meter reset counter, which will be increased every time the meter is read and the register is reset.

When a 5 digit meter registers values in a cumulative approach the meter will keep on counting from 0 until it reaches 99999, at this point it will roll over to 00000 and will keep on counting again from 0.



When we take a look at the index values, we see both devices have the index value 700 on January 1st 2011 and 785 on January 10th. The contractor's consumption however will be quite different. In the delta approach that meter would also have been reset to 0 on January 1st meaning that the consumption over these 10 days would be 785. With the cumulative approach the meter was not reset to 0 and we would need to calculate consumption by taking the meter reading of January 10th, being 785, minus the meter reading of January 1st being 700, implying that the consumption would be 85 kWh. Correctly identifying how the meter registers is of utmost importance.

1.15 Entities in master data



This simplified diagram gives a clear overview of the master data that's discussed so far. On the left hand side we have the customer. As you saw before, a customer in MECOMS™ covers a very broad concept. The customer will play a certain role for a specific connection, that role is referred to as the account type. The customer who will be paying the bill would be the contractor.

In the middle we have the connection. The connection is not only linked to a customer yet also to one or more meter devices. This can be e.g. a simple single tariff manual meter or a double tariff manual meter. For more detailed registration at regular intervals one would use an Automatic Meter which can be read remotely. By comparing the registered counter values to a calendar, the values can then be linked to a high or low tariff. Charging a high and a low tariff is often used as an incentive to gently push people to change their consumption patterns, which on a large scale may contribute to keeping the network balanced.

These 3 entities: customer, connection and device will ultimately form the configuration in the MECOMS™ system. To continue our brain teaser we will assume that our contractor Sarah Doe lives and consumes at Main Street Nr 5 in Utopia and has a single tariff electricity meter measuring cumulative consumption. Typically, we would receive all meter and connection related information through messaging from the DGO. All we need now to calculate the consumption are meter readings.

1.16 Meter reading

1.16.1 Who

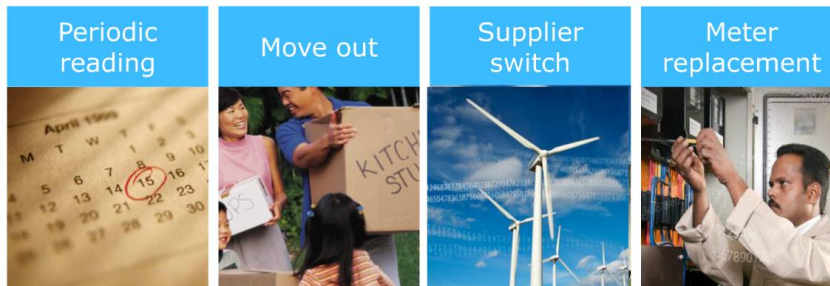
There is a variety of ways in which meter readings can be retrieved. In case of a smart meter or AMR meter the meters can be read remotely. In case of an MMR meter somebody will physically need to go over to the meter and write down the meter values. This could either be done by the meter reader who will be assigned a daily tour and who will need to ask to be allowed to the customer's house to register the meter values using a PDA.

A meter can also be read by Sarah the customer. She might receive a post card on which she will have to write down the meter reading and that she will have to send back to the meter reading company. They will use OCR or optical character recognition to scan the postcard and process the meter readings.

Alternatively she might be able to log on to a web portal where she can enter the readings or she might report the meter values by telephone and use the telephone dial or an interactive voice response to report the meter readings.

Finally, we might also receive the meter readings from a third party in the form of a file.

1.16.2 When



When exactly do we require a meter reading?

First of all we need to consider the periodic meter reading. The interval of which depends on local market regulations and the agreement between supplier and customer. In one country the meter might be read on a yearly basis, whereas in another country the meter might be read on a monthly or even a daily basis. Let's assume that in our example the meter will be read once a year.

Year 1 the meter reading company will send over a meter reader. In case the customer is not home the meter reader may pay a return visit or may request the customer to provide the reading himself. Business processes may also indicate that an estimated value will be used.

Year 2 the customer will be asked to provide the meter readings himself. If the customer does not provide the reading an estimated value will be used.

In this way we might end up with using estimated values year in year out, however legislation in most cases stipulates that at least once every N years an actual meter reading is required.

Besides the periodic reading a meter reading is also required in case a customer moves out. The supplier needs to be able to create an end note or final invoice. If somebody else moves into the house the very same index will be used as starting index for that new customer.

The same logic applies when the customer decides to change supplier. From supplier A, supplying nuclear energy, to supplier B, supplying green energy for example. Supplier A will need a meter value to calculate his end note and supplier B will use this very same value as starting index.

Finally, we would require a meter reading if the meter is being replaced because the customer would like to change from a manual single tariff meter to a double tariff meter for example.

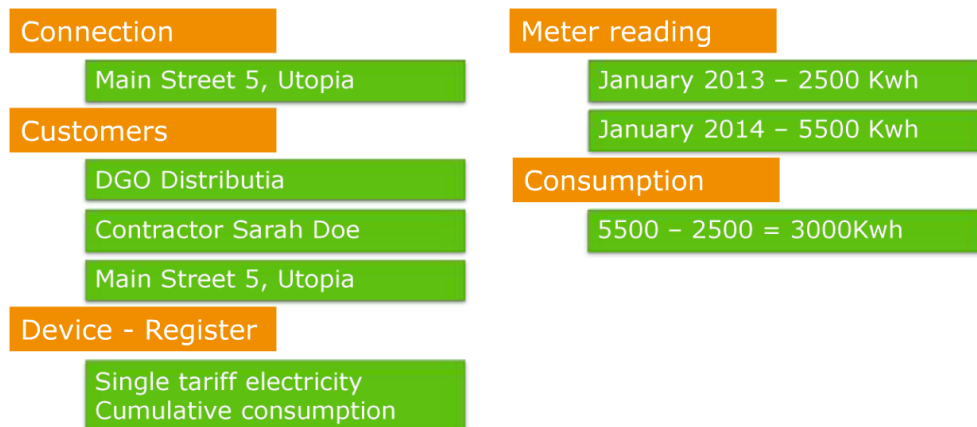
1.16.3 Validation

Regardless of how the meter readings are retrieved they would then be validated, meaning that the numbers are verified to see if they are realistic or not.

It may seem obvious that you would want to validate readings provided by the customer, as they might cheat in order to pay less. Yet also meter readings that were retrieved automatically or by a meter reader will be verified. By comparing the customer's consumption to his "consumption history" we can deduct if the current reading is realistic or not. MECOMS™ allows you to set up validation rules. If e.g. this year's consumption is more than double the amount of last year's consumption it would be marked as invalid. Checking if the current meter reading is too high or too low compared to the customer's consumption history are just 2 examples of criteria that can be checked to verify if a meter reading is realistic or not. If yes, the value can be used to calculate a consumption value. If no, then no consumption can be calculated and business processes will indicate how to proceed. E.g. ask for a confirmation from the customer or plan a return visit by a technician.

1.17 Calculate consumption

1.17.1 Electricity Consumption / Water Consumption



In our example we stipulated that the contractor Sarah Doe lives and consumes at Main Street Nr 5 and has a single tariff electricity meter measuring cumulative consumption. The meter is being read once a year. If we add to that a meter reading of 2500 kWh on Jan 1st 2013 and a meter reading of 5500 kWh on Jan 1st 2014 we can calculate a consumption. As the meter is registering in a cumulative approach we will need to take the current meter reading and deduct the previous meter reading. In this case that would mean the customer has consumed 3000 kWh in 2013.

Bear in mind that calculating a consumption will not always be as straightforward as in our example. We may have a customer with a double tariff in which case we would need to calculate 2 consumptions, one for the day or high timeframe and one for the night or low timeframe. Each consumption would then be charged at its respective tariff.

Besides that we need to consider that there are also unmeasured connections. If we consider water e.g. it is quite common that there is no meter whatsoever. Customers in this case will be invoiced based on consumption units. This could be amount of inhabitants, or could be based on the amount of taps, lavatories, showers and bath tubs. In the later example you may decide to charge more for a bath tub than for a shower by giving that consumption unit a higher weight. Unmeasured connections are in fact not that complex at all, yet simply require a different approach when it comes to invoicing.

1.17.2 Gas consumption

1.17.2.1 Conversion factor

Calculating gas consumptions is also quite different as here we need to take conversion and correction factors into account. Gas meters measure in cubic meter or in cubic feet, yet customers are charged in kWh. So we need to find a way to transpose the measurement. Typically this would be done by multiplying the consumption with a conversion factor.

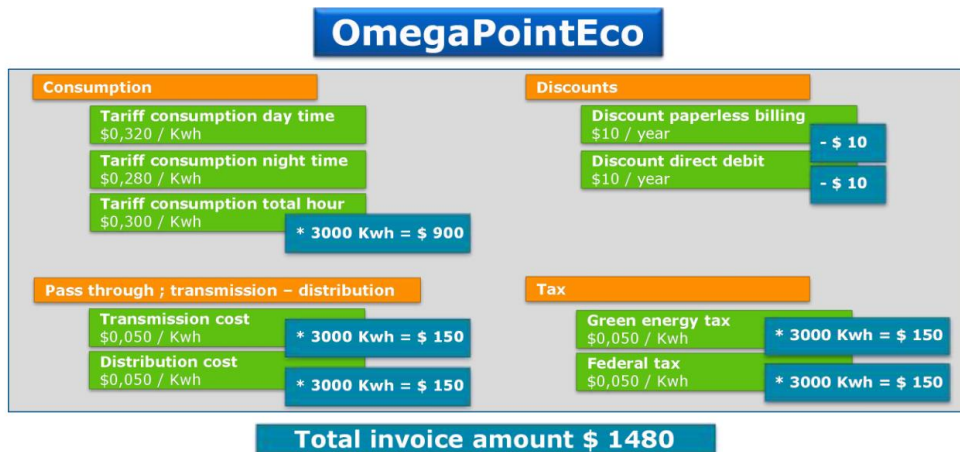
1.17.2.2 Correction factor

Secondly we need to keep in mind the differences in the calorific values of gas, the pipeline pressure and the temperature. The calorific value is basically the amount of energy the gas contains, and is sometimes referred as the quality of the gas.

Depending on your location or on the seasons, the quality, temperature and pipeline pressure will vary, and needs to be measured at regular occasions. The so called correction factors allow us to take these differences into account when calculating the consumption charges. Some countries use a combined conversion and correction factor. For detailed information on this topic we can only suggest that you take a look at the websites of your local supplier.

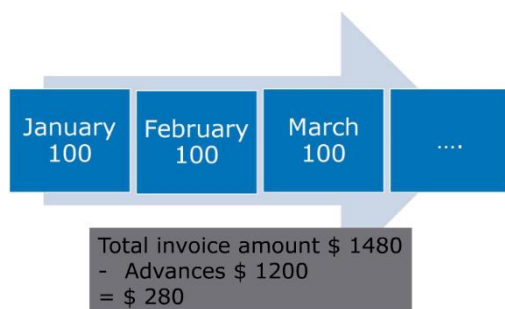
1.18 Invoice amount

Time to return to our customer Sarah Doe. We have now received the yearly meter reading and have calculated the consumption. This means that we are ready to calculate also the invoice.



As Sarah Doe has a single tariff meter we will need to apply the total hour consumption tariff. Secondly as she receives her invoices by email and pays through direct debit she will get both discounts. If we do the math, this adds up to a total invoice amount of 1480.

1.19 Advance amount



Based on the customer's average consumption we had asked her to pay a monthly advance amount of 100. An advance amount is typically calculated on the estimated annual volume of the customer. This can be calculated based on the customer's "consumption history".

If the customer consumed 2500 kWh the previous year then the advance would be based on that consumption. If no "consumption history" is available for the customer at that specific location e.g. because he is a new customer or because he has moved into a new house, then a load profile can be used to determine the advance amount. This synthetic load profile would indicate how much energy a typical residential customer would use throughout the year and how this total consumption amount would be divided over the different months.

A supplier may also decide to allow the customer to specify the advance amount themselves. Either way we obviously will need to deduct the advance amounts that had already been paid from the total invoice amount.

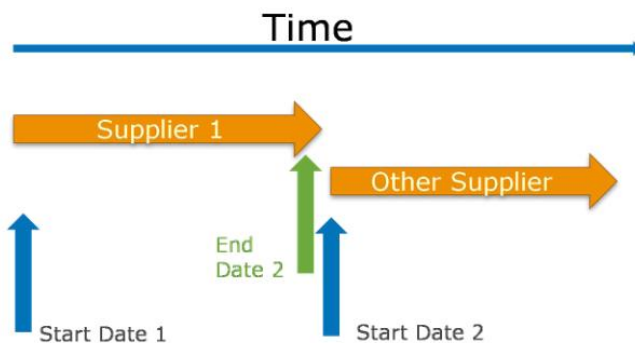
In this case there is an outstanding amount of 280.

1.20 Energy and utilities community architecture

By going through our brain teaser we have touched upon some business processes involved from sending out a price offer to the prospect to sending out an invoice. MECOMS™ integrates all processes related to CIS (customer information system), MDM (meter data management) and EAM (enterprise asset management) in one system. The customer is not forced to purchase all modules, as the system itself, as well as the pricing structure is setup in a modular fashion.

The data is stored in the EUCA data model, which stands for Energy and Utilities Community Architecture. This model, which has been designed exclusively for the energy and utility sector, is 100% documented, does not duplicate data across multiple databases, and is the central repository for all business processes executed in MECOMS™. Secondly, the data in the model is accessible through standard connectors, which allow MECOMS™ to serve as a data hub for other applications, both internal as well as externally, through the use of the flexible messaging framework.

1.21 Time slicing



All important data entities in the system use the concept of time slicing, allowing the user to reproduce a specific situation in time, showing all changes which happened with this object, allowing detailed auditing of the data in the system.

This is practical when you need to regressively calculate a consumption for example. This is the so-called flash-back functionality. You could also perform calculations as if they would happen in the future for forecasting purposes.

Let's take a look at a more concrete example:

Start date	End date	Valid from	Valid until	Price
1/01/2011	31/01/2011	15/12/2010	0	10,00
1/02/2011	28/02/2011	15/12/2010	0	110,00

Change in price on 10/01 for period 01/01/2011 - 31/01/2011				
1/01/2011	31/01/2011	15/12/2010	10/01/2011	10,00
1/01/2011	31/01/2011	10/01/2011	0	100,00
1/02/2011	28/02/2011	15/12/2010	0	110,00

December 15th 2010 we enter a price in the system for two periods:

- 01/01/2011 until 31/01/2011
- 01/02/2011 until 28/02/2011

The start date for the first period is Jan 1st 2011, for the second period this is Feb 1st 2011.

The end date for the first period is Jan 31st 2011, for the second period this is Feb 28th 2011.

For both periods the valid from date is Dec 15th 2010 which is the date we entered the prices in MECOMS™ and the valid until date is zero, because the record is still valid.

January 10th, we notice that we entered a wrong price for the first period and changed it.

Start date and end date for this period stays the same, the valid from date as well, but the valid until date changes from zero to Jan 10th 2011. A new line is created with the same start/end date, the valid from date is equal to Jan 10th 2011 as we are changing the price in the system on this date, and the valid until date is equal to zero again. More information on time slicing is given during the technical training.